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Degradation Behavior of $LaNi_{4.87}Sn_{0.22}H_x$ at Elevated Temperature

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Partial substitution of tin for nickel in the $LaNi_5$ alloy greatly enhances the stability and durability of the hydride phase during both gas phase and electrochemical cycling. Samples of the slightly non-stoichiometric alloy $LaNi_{4.87}Sn_{0.22}$ were held at a hydrogen content of $x > 5.0$ and temperatures above 460 K to accelerate the intrinsic degradation processes. Changes in the hydrogen absorption and desorption were evaluated using gas volumetric methods. Although the Sn-substituted alloys are much more resistant to disproportionation than most other $LaNi_5$ alloys, the present test conditions did produce degradation. Effects observed included reduction in hydrogen storage capacity, decreases in the plateau pressures, increased slopes of the plateaus, and smaller hysteresis ratios. The degradation rates increase quite rapidly with temperature and are tentatively attributed to hydrogen-induced enhanced mobility of metal atoms that create disorder in the host lattice. A physical model for these processes along with derived activation energies will be presented.

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